

I claim:

1. An apparatus for the production of ammonia by the reaction of hydrogen and nitrogen comprising:
 - 5 (a) a reaction chamber with both an upper reaction cavity and a lower reaction cavity;
 - (b) said upper and lower cavities separated by a hydrogen permeable structure;
 - (c) a first means for supplying a gaseous hydrocarbon mixture into said lower reaction cavity;
 - (d) a second means for supplying air into said lower reaction cavity;
 - 10 (e) an oxidation structure within said lower cavity for burning said air;
 - (f) means for transferring nitrogen from said lower reactor cavity to the upper reactor cavity for catalytic conversion to ammonia in the presence of hydrogen; and,
 - (g) means for transferring exothermic energy from said upper reaction cavity to said lower reaction cavity whereby the additional energy need of the lower of said cavities
 - 15 is reduced.
2. The apparatus according to claim 1 wherein said oxidation structure within the lower cavity for burning air is a hot cylinder heated by the internal burning inside of natural gas and air.
- 20 3. The apparatus according to claim 1 wherein the hot cylinder within the lower cavity is used to thermally decompose methane to form hydrogen and carbon.

4. The apparatus according to claim 1 wherein said hydrogen permeable membrane is formed of palladium (Pd) metal.
- 5 5. The apparatus according to claim 1 wherein the upper reaction cavity contains a reservoir with permeable walls to receive nitrogen gas that reacts with hydrogen gas from the lower reaction cavity to form ammonia.
6. The apparatus according to claim 5 wherein the ammonia forms during an
10 exothermic energy reaction.
7. A method for the production of ammonia comprising the steps of:
- (a) thermally decomposing a mixture of air and a gaseous hydrocarbon to produce hydrogen and nitrogen;
- 15 (b) separating the hydrogen from the nitrogen and thereafter scrubbing the nitrogen to remove the oxygen;
- (c) reacting the hydrogen and the scrubbed nitrogen in an exothermic reaction to produce ammonia and exothermic energy; and,
- (d) transferring the excess exothermic energy to the endothermic reaction whereby its
20 need for additional reaction energy to be supplied from external sources is reduced.
8. The method for the production of ammonia according to Claim 7, wherein the gaseous hydrocarbon is natural gas.

9. The method for the production of ammonia according to Claim 7, wherein the gaseous hydrocarbon is methane.

5 10. The method for the production of ammonia according to Claim 7, wherein the means for separating hydrogen from the nitrogen is a hydrogen permeable membrane.

11. The method for the production of ammonia according to Claim 10, wherein the hydrogen permeable membrane is palladium (Pd) metal.

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12. The method for the production of ammonia according to Claim 7, wherein means are provided, in a single vessel, for carrying out both thermally decomposing air and hydrocarbons and reacting the hydrogen and the scrubbed nitrogen.

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